

From inner to outer space, Los Alamos science goes big in 2017

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Supercomputers, top experimental facilities drive breakthroughs from earth to space, bio to black holes, materials innovation to high-tech invention

LOS ALAMOS, N.M., Dec. 21, 2017—With a top-story list populated by breakthroughs in supercomputing, accelerator science, space missions, materials science, life science, and more, Los Alamos National Laboratory put its Big Science capabilities to wide, productive use in 2017.

“No discipline left untouched—that’s the story from Los Alamos in 2017,” said Alan Bishop, Principal Associate Director for Science, Technology and Engineering at Los Alamos. “In a remarkably productive year, Laboratory researchers have grabbed headlines for their research in everything from physics to explosives modeling to

HIV vaccine developments. Teamwork across the disciplines from biology and biotech to astrophysics and space science drives our innovation in support of the Laboratory's national security mission. All the work capitalizes on the Lab's world-class supercomputing and experimental facilities—and its people.”

Here are some of the big science stories from Los Alamos as 2017 comes to a close:

[Unique imaging of a dinosaur's skull tells evolutionary tale](#)—Using the Laboratory's unique neutron-imaging and high-energy X-ray capabilities, researchers have exposed the inner structures of the fossil skull of a 74-million-year-old tyrannosauroid dinosaur nicknamed the Bisti Beast in the highest-resolution scan of a tyrannosaurus skull ever done.

[Los Alamos' Trinity Supercomputer lands on two top-10 lists](#)—It made number three on the High Performance Conjugate Gradients (HPCG) Benchmark project and number seven on the Top500 list. Working with the National Nuclear Security Administration, the Laboratory applies the capabilities of Trinity to providing assessments that ensure the nation's nuclear stockpile is safe, effective and secure.

Mars News

- [Discovery of boron on Mars adds to evidence for habitability](#)—Boron was discovered in calcium-sulfate veins on Mars using the ChemCam instrument on NASA's Curiosity rover. Boron compounds play a role in stabilizing sugars needed to make RNA, a key to life.
- ['Halos' discovered on Mars widen timeframe for potential life](#)—Lighter-toned bedrock that surrounds fractures and comprises high concentrations of silica—called “halos”—has been found in Gale Crater on Mars, indicating that the planet had liquid water much longer than previously believed.
- [Rover findings indicate stratified lake on ancient Mars](#)—A long-lasting lake on ancient Mars provided stable environmental conditions that differed significantly from one part of the lake to another, according to a comprehensive look at findings from the first three-and-a-half years of NASA's Curiosity rover mission.

[Los Alamos research fundamental to first efficacy study for mosaic HIV-1 preventive vaccine](#)—International partners announced the first efficacy study for an investigational HIV-1-preventive “mosaic” vaccine. The HIV-1 mosaic vaccine in the trial was originally designed at Los Alamos National Laboratory by theoretical biologist Bette Korber and her team.

[Machine-learning earthquake prediction in lab shows promise](#)—By listening to the acoustic signal emitted by a laboratory-created earthquake, a computer science approach using machine learning can predict the time remaining before the fault fails.

[Breaking the supermassive black hole speed limit](#)—Using computer codes for modeling the interaction of matter and radiation related to the Lab's stockpile stewardship mission, scientists simulated collapsing stars that resulted in supermassive black holes forming in less time than expected, cosmologically speaking—in the first billion years of the universe.

[First-ever U.S. experiments at new x-ray facility may lead to better explosive modeling](#)—For the first time in the United States, time-resolved small-angle x-ray scattering (TRSAXS) is used to observe ultra-fast carbon clustering and graphite and

nanodiamond production in the insensitive explosive Plastic Bonded Explosive (PBX) 9502, potentially leading to better computer models of explosive performance.

[Scalable clusters make HPC R&D easy as Raspberry Pi](#)—A quest to help the systems software community work on very large supercomputers without having to actually test on them has spawned an affordable, scalable system using thousands of inexpensive Raspberry Pi nodes. It brings a powerful high-performance-computing testbed to system-software developers, researchers, and others who lack machine time on the world's fastest supercomputers.

[Quantum dots amplify light with electrical pumping](#)—Los Alamos—designed quantum dots achieve a breakthrough with electrical stimulation, showing the feasibility of a new generation of highly flexible, electrically pumped lasers processable from solutions that can complement or even eventually displace existing laser diodes. These prospective devices can enable a variety of applications, from RGB laser modules for displays and projectors to multi-wavelength micro-lasers for biological and chemical diagnostics.

[Eight Los Alamos innovations win R&D 100 Awards](#)—Since 1978 Los Alamos has won more than 145 of the prestigious R&D 100 Awards, and this year it took eight, plus an innovation award. “The R&D 100 Awards represent the breadth, depth and innovation of the science and engineering at our Laboratory. They also reflect our partnerships with other government laboratories, universities and private industry,” said Director Charlie McMillan.

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